

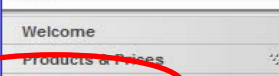
75. Sitzung des AKA, 1-2 Oct. 2008, Karlsruhe, Fachverband für Strahlenschutz e.V.

NUCLEONICA Overview: A WEB PORTAL FOR THE NUCLEAR SCIENCES

J. MAGILL

*European Commission, Joint Research Centre,
Institute for Transuranium Elements,
Postfach 2340, 76125 Karlsruhe, Germany*





... web driven nuclear science

Sunday, November 18, 2007

Home

username Login

Welcome

Products & Prices

Free Access

Training Courses

Educational Resources

Karlsruhe Nuclide Chart


News Releases

Ask an Expert

About Us

Contact

Nucleonica - web driven nuclear science



NUCLEONICA is a new nuclear science web portal from the European Commission's Joint Research Centre. The portal provides a customisable, integrated environment and collaboration platform for the nuclear sciences using the latest internet "Web 2.0" dynamic technology.

NUCLEONICA is aimed at professionals, academics and students working with radionuclides in fields as diverse as the life sciences (e.g. biology, medicine, agriculture), the earth sciences (geology, meteorology, environmental science) and the more traditional disciplines such as nuclear power, health physics and radiation protection, nuclear and radiochemistry, and astrophysics. It is also used as a knowledge management tool to preserve nuclear knowledge built up over many decades by creating modern web-based versions of so-called legacy computer codes.

NUCLEONICA provides "software as a service" on the web rather than through installed software, adding a greater level of stability and security and avoiding version compatibility and update problems. In addition, all NUCLEONICA's web applications are browser and operating system independent and can therefore be accessed by most web browsers.

NUCLEONICA offers the following main features:

- » **Data Centre:** Online interactive nuclide charts. Reference data and searchable databases for internationally evaluated nuclear data. Library creation software.

NUCLEONICA HOT TOPICS

» **Open Call for JRC Traineeships**

November 14, 2007

ITU's first open call for JRC-Traineeships has been published on our website. The deadline for applications is 6 December 2007 (midnight). In particular we have a position for assistance in the development of an electronic version of the Karlsruhe

NUCLEAR NEWS

French FM: France is not ruling out a military strike on Iran

NOV 18 Even though in Tehran the IAEA's report was described as a "political victory" that may prevent the intensifying of international sanctions, Kouchner says that "for now Iran persists in not meeting it [...]"

Iran: UNSC interference illegal

NOV 18 Mohammad Saeedi, a senior Iranian nuclear official has said insistence on pursuing Iran's nuclear program at the Security Council lacks legal grounds, PressTV reported. [...]

Iran says ready to act if attacked ...


NOV 18 LONDON, November 18 (IranMania) - Hardline Iranian President Mahmoud Ahmadinejad said Iran was ready to respond if attacked, but played down the prospect of war with the United States, Reuters reports [...]

'Safe' uranium that left a town contaminated

NOV 18 It is 50 years since Tony Ciarfello and his friends used the yard of a depleted uranium weapons factory as their playground in Colonie, a suburb of Albany in upstate New York state. "There wasn't no [...]"

Chavez dealing pain to Spain

NOV 18 Chavez, who has nationalised large parts of the economy this year under his self-styled socialist "revolution", said last week he will revise diplomatic and business ties with the

Nuclear Science Data & Applications

Nucleonica Wiki (CMS)

Networking with Nucleonica

Training Courses

[illegible]

Radiative Decay Channels

It is very often the case that the decay product of a nuclear disintegration is itself radioactive. In such cases one speaks of radiatively decaying "chains" and, for example, considers the decay chain $^{238}\text{U} \rightarrow ^{234}\text{Th} \rightarrow ^{234}\text{Pa} \rightarrow ^{234}\text{U} \rightarrow \dots$ or, in other words in "easier" words, chain to the "daughter". This daughter in turn is radioactive and decays to ^{234}Th , then generally and eventually to the stable ^{206}Pb . ("As" there is more to say on daughter, in addition, these may also be called "daughters" of the products of the decay from the decay of the parent.)

The equation for radioactive disintegration decays in a more complicated way. The general process of radioactive decay was first investigated systematically by Bateman (Ph. Camb. Phil. 1910) and later by Sklar (see, e.g., *Math. Physics 1974) from the decay of ^{238}U .*

Figure 1. Diagrammatic solution of decay with branching and source terms.

The differential equation governing the above process can be written as

$$\frac{dN_i}{dt} = \lambda_{i-1} N_{i-1} - \lambda_i N_i$$

$$\frac{dN_1}{dt} = \lambda_0 N_0 - \lambda_1 N_1$$

$$\frac{dN_2}{dt} = \lambda_1 N_1 - \lambda_2 N_2$$

$$\vdots$$

$$\frac{dN_n}{dt} = \lambda_{n-1} N_{n-1} - \lambda_n N_n$$

$$\vdots$$

$$\frac{dN_N}{dt} = \lambda_{N-1} N_{N-1} - \lambda_N N_N$$

where N_i is the number of atoms of species i present at instant t , λ_i is the decay constant (first removed constant) for species i and λ_0 is the source term.

At Bateman's time, a system of n ordinary equations (ODE) like the above can be solved by the method of variation of constants (see, e.g., *Math. Physics 1974) or, in other words, by the method of variation of constants (see, e.g., *Math. Physics* 1974).*

Business Networking

- Start
- My Contacts
- My Address
- My Mailbox
- My Calendar

Free Applications

- Forum
- Conference Calendar
- Organics Module

Organic Applications

- myOrganic Software

Learning zone

- Open text for JRC Transcripts
- Review of Applications in MSD review 2017/18
- Proceedings of the 9th International Training Course for scientists

Webinars and E-learning

- Open text for JRC Transcripts
- Review of Applications in MSD review 2017/18
- Proceedings of the 9th International Training Course for scientists

Publications

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October 2007 Karlsruhe

Nuclear Science Teaching Course with Neutronics, 25/26th Oct. 2007, Ostrodtshofen, Karlsruhe

The 18th Nuclear Science Teaching course on Radioactivity, Radioisotopes and Radiation with Neutronics was held at the Ostrodtshofen, Karlsruhe from the 25th to the 26th October. This five-day course provided a general introduction to the recently advanced neutronics, the new science combining and applying particle, nuclear and reactor physics with modern software packages for the routine sciences currently. With examples and exercises, a variety of case studies and topical issues in nuclear science and technology were presented by experts in their respective fields.

A total of forty-nine participants, around half of them women, with a diverse range of backgrounds attended the course. There were participants from Austria, Belgium, Czech Republic, Canada, Russia, Poland, Romania and Turkey. In addition there were 12 participants from the Institute for Neutronics and Reactor Physics, who were students, academics and industry professionals from fields such as nuclear medicine, radiation protection, environmental monitoring and medical physics.

Few Augustus 26th Oct. 2007

We've got time to go back to the conference training centre


Links to the presentations and exercises:

- Networking with Neutronics (c. Magd) Exercises
- Nuclear Data (c. David) Exercises
- Nuclear Chain (c. Norwatt) Exercises
- Dose Drings (A. Beldard) Exercises
- Discovery & Working (c. Jack) Exercises
- Nuclear Processes & Fuel Trafficking (p. Mayo) Exercises
- Oversight of the Institute for Transuranium Elements (C. Wasth)
- Advanced Neutronics Exercise (c. Magd)

Training Course Feedback

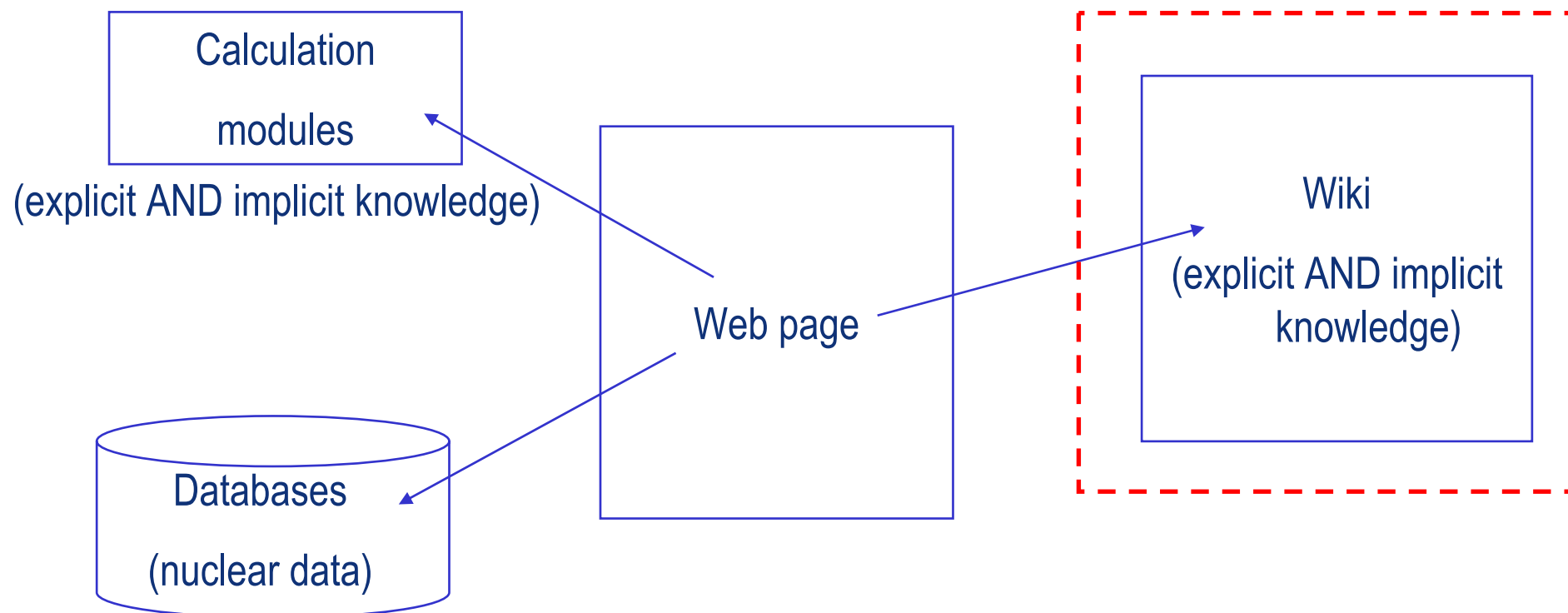
Our Participants

List of Certificate



Group Photo Oct. 2007, Ostrodtschhofen Institute

Nucleonica Architecture & Logical Structure...



The NUCLEONICA Structure

Data centre...

Nuclear Data Retrieval

NucleonicaEFF 3.1 | GAT Panel Games | CRP | Hit Table at bottom

Select Database: Nucleonica

Rad Search | Radiation Search | Advanced Search

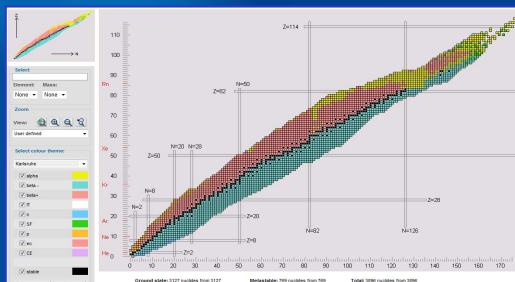
Rad Search - Search Variables & Range

Energy: 300 keV to 1 MeV
 Alpha: 1 MeV to 1 MeV
 Z: 1 to 1
 Mass number: 1 to 1
 Half-life: 1 to 1

Search | Save to my defaults | Reset

Search returned 6 results

| Isotope | Energy (keV) | Half-life (years) | Decay mode |
|-----------|--------------|-------------------|---------------|
| 60 Ni-151 | 800.2 | 0.01483 | 12.44 (x 7) m |
| 95 Au-241 | 899 | 6.84E-10 | 432.8 (x 7) s |
| 60 Ni-151 | 800.8 | 0.000257 | 12.44 (x 7) m |
| 95 Au-241 | 899.6 | 2.33E-09 | 432.8 (x 7) s |
| 60 Ni-151 | 300.58 | 0.01821 | 12.44 (x 7) m |
| 95 Au-241 | 300.5 | 1.188E-07 | 432.8 (x 7) s |



Nuclear science portal ...

nucleonica ... web driven nuclear science

Applications | My Preferences | Help | New Alerts

Nuclide Explorer

Application Centre

- Mass Activity Calculator
- Decay Engine
- Dosimetry & Shielding
- Range & Stopping Power
- webKORIGEN
- Universal Nuclide Chart
- Transport & Packaging
- Nuclide mixtures
- Nucleonica Scripting
- Library creation for 3rd party software
- Radiological Dispersion Module
- Extended Graph Module

Search Nucleonica Documentation

Nuclear Data Retrieval

Data Centre

- Physical Constants
- Nuclide Datasheets
- Nuclide Derived Data
- Average Cross Sections
- Radiations
- Prompt Gamma
- Fission Yields

Knowledge Centre

- Nuclear News
- Reading room
- Useful Weblinks
- Ask An Expert

My Last Nuclides

- 82 Pb210
- 88 Ra226
- 55 Cs137
- 40 Zr95
- 84 Po210

My Nuclide Mixtures

- Ra-226 + daughters (1g at 1y)
- Decay Engine Result
- Rb-81 + daughters (190 MBq)
- Rb81(1g)+Kr81m
- Transurics in 1 ton Spent Fuel (4.2% enriched, 50GWd/t, 6 years cooling)

My Sources

- natu

My Messages

- Maintenance Work
- NAMLS-9 International Conference on Nuclear Analytical Methods in the Life Sciences
- Request for photos of non-stable elements

User Alerts

Applications centre...

Decay Engine
84 Polonium

Actual Chart: Karlsruhe

Element: Po-210 | Mass: 210 | Nuclear Data Selector

Decay Engine | Options

Quantity: Grams | 1 | Accuracy Factor: 1E-02
 Time: Minutes | 8.10E+01 | Number of timesteps: 40 | Number of chains: 1

Start | Start in background | Reset | Show details | Create Nuclide Mixture

| Isotope | Energy (keV) | Half-life (years) | Decay mode | log Relative Int. |
|-----------------|--------------|-------------------|------------|-------------------|
| 84 Po210 | 3.1 m | 3.72E+13 | 1.35E-01 | 1.35E+11 |
| 82 Pb214 | 26.8 m | 3.84E+20 | 1.37E-01 | 1.66E+17 |
| 83 Bi214 | 19.9 m | 5.47E+20 | 1.84E-01 | 3.17E+17 |
| 84 Po214 | 1.662 µs | 7.50E+13 | 2.65E-01 | 3.17E+17 |
| 82 Pb210 | 22.17 y | 1.03E+01 | 5.36E-01 | 1.91E+12 |
| 83 Bi210 | 5.01 d | 3.97E+15 | 1.38E-01 | 6.35E+09 |
| 84 Po210 | 1.462 d | 8.98E+12 | 3.13E-01 | 6.21E+05 |
| 82 Pb206 Stable | stable | 5.39E+08 | 1.84E-13 | 0 |
| Total | | 3.76E+21 | 8.66E-01 | 8.01E+17 |

easyMonteCarlo
27 Cobalt

Actual chart: Karlsruhe

Element: Co-60 | Mass: 60 | Mixture selector: Co-60 | Shield: Paraffin | Detector: Particle flux

Activity (Bq) | 1E+12 | Compound | Element | Pu | Dose rate

Start | Stop | Resume | First spectrum to 0.050

Geometry | Source Options | Results | Input Parameters | Service Output

Trial/slice: 100
 Status: Calculation in progress: 2700 trials executed
 Particle flux AcM/s: 1.079E+07 | Uncertainty: % 2.90 | Flux buildup: 2.96 | Uncertainty: % 2.96

Photon detector: 100 .. 2700 trials

Cumulative value | 0.100 MeV photons | 0.111 MeV photons | 1.26 MeV photons

Knowledge centre...

nucleonica [wiki]

ReadingRoom: Gallery of Nuclear Science

Contents (new)

- Actinide Science
- Nuclear Science Historical
- Nuclear Science in Karlsruhe
- Karlsruhe Nuclide Chart, 7th Edition, 2006

Actinide Science

from the Actinide Group, Institute for Transuranium Elements...

Sample of refined americium metal condensed on a tantalum disc (SPINEL, 1991), copyright EC-JRC-ITU

Curium metal produced by the Actinide Group, Institute for Transuranium Elements

Protactinium: Courtesy of the Actinide Group

Uranium metal cube, Institute for Transuranium Elements

Navigation: Main Page, Community portal, Current events, Recent changes, Random page, Help

Search: Go | Search

Toolbox: What links here, Related changes, Upload file, Special pages, Printable version, Permanent link

Networking centre...

Nucleonica Networking

Start | My Profile | My Contacts | My Mailbox | My Groups

Free Applications

- Forum
- Conference Calendar
- Graphics Module

Upgrade Applications

- nuclear science

Coming soon

- Open call for JRC Traineeships
- Review of Nucleonica in NVS news 2007/3
- Proceedings of the 9th Nucleonica Training Course now available

Open Call for JRC Traineeships

November 14, 2007
 JRC's first open call for JRC Traineeships has been published on our website. The deadline for applications is 6 December 2007 (midnight). In particular we have a position for assistance in the development of an electronic version of the Karlsruhe Nuclide Chart. For more details...

US talks tough over Iran, warns China

The US has pledged to step up to drive for new UN sanctions on Iran and warned China against seeking diplomatic efforts to halt the Islamic republic's nuclear ambitions.

Source: expressindia Language: EN Date: 2007-11-16T07:41+0100

North and South Korea to launch regular cross-border train service

The train service, limited to freight, will launch next month for the first time in more than half a century.

Source: HT Language: EN Date: 2007-11-16T07:31+0100

US talks tough on Iran, warns China

WASHINGTON (AFP) - The United States accused Iran Thursday of "holding along" UN watchdogs investigating its nuclear ambitions and bluntly warned China not to block new sanctions against the Islamic republic.

Source: ap-english Language: EN Date: 2007-11-16T07:10+0100

IAEA gives clean bill to Iran on 18 plan

Web posted at: 11/16/2007 8:12:22 Source: AP Vienna - A report from the UN nuclear watchdog agency yesterday found Iran to be generally truthful about key aspects of its nuclear history, but it warned that its knowledge of Tehran's present atomic work was shoddy.

Source: theepicentre Language: EN Date: 2007-11-16T06:59+0100


WebKORIGEN

Step 1: Calculation Mode | Step 2: Reactor / Operation | Step 3: Input Summary and Run | Step 4: Display Result

Reactor irradiation | Decay | Reactor irradiation and decay | Reactor irradiation, cooling, reprocessing and decay of waste

Power | Flux

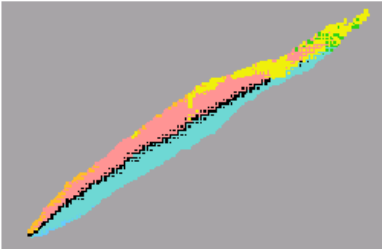
Nuclear science applications...



... web driven nuclear science


ApplicationsMy PreferencesHelp


> Nuclide Explorer



» Actual Chart: Karlsruhe

> Search Nucleonica Documentation

 Nuclear Data Retrieval



> Application Centre

- » Mass Activity Calculator
- » Decay Engine
- » Dosimetry & Shielding
- » Range & Stopping Power
- » webKORIGEN
- » Universal Nuclide Chart
- » Transport & Packaging
- » Nuclide mixtures
- » Nucleonica Scripting
- » Library creation for 3rd party software
- » Radiological Dispersion Module
- » Gamma Spectrum Generator (IE only)
- » easy Monte Carlo (IE only)
- » Extended Graph Module

> Data Centre

- » Physical Constants
- » Nuclide Datasheets
- » Nuclide Derived Data
- » Average Cross Sections
- » Radiations
- » Prompt Gamma
- » Fission Yields






> Knowledge Centre

- » Nuclear News
- » Reading room
- » Useful Weblinks
- » Ask An Expert






Welcome, Joe

| | |
|------------------------------------|--------------------------------|
| Edit Preferences | Administration |
| MyCommunity Portal | |



> My Last Nuclides

-  63 Eu152
-  84 Po210
-  27 Co60
-  37 Rb98
-  37 Rb88

> My Nuclide Mixtures

-  Natural Thorium
-  Natural Uranium
-  U232+Co60
-  Cs137 + Ba137m
-  Depleted Uranium (0.4%U235)

> My Sources

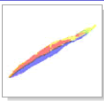
-  Pu239 1 g
-  natu

> My Messages

No messages for you at the moment

> User Alerts

No alerts at the moment



Nuclear Data Retrieval

Nucleonica/JEFF-3.1 EGAF Prompt Gammas ICRP 8th Table of Isotopes

Select Database: Nucleonica

Nuclide Search Radiation Search Advanced Search

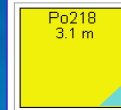
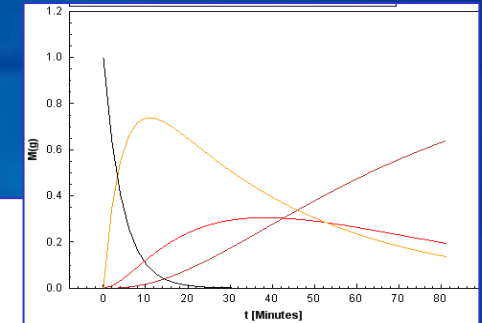
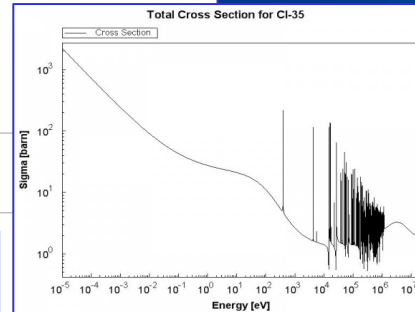
Radiation Search - Search Variables & Range

☒ Gamma and X-Rays Energy: 300 +/- 1 keV
☐ Alpha Energy: 600 +/- 1 keV
Z: Mass number: Half-life: Seconds

Search Save to my defaults Reset

Search returned 6 results
Number of nuclides (ground + isomeric states): 2

| Nuclides | Gamma and X-Rays (keV) | Emission Probability | Half-life |
|-----------|------------------------|----------------------|---------------|
| 60 Nd 151 | 900.2 | 0.001463 | 12.44 (± 7) m |
| 95 Am 241 | 899 | 6.84E-10 | 432.8 (± 7) y |
| 60 Nd 151 | 600.8 | 0.0002527 | 12.44 (± 7) m |
| 95 Am 241 | 599.6 | 2.232E-09 | 432.8 (± 7) y |
| 60 Nd 151 | 300.58 | 0.018221 | 12.44 (± 7) m |
| 95 Am 241 | 300.2 | 1.188E-07 | 432.8 (± 7) y |



Decay Engine 84 Polonium

Actual Chart: Karlsruhe

Element: Mass:

Po 218 Nuclide Mixtures Selector

Decay Engine Options

Quantity: Grams 1 Accuracy Factor: 1E-02
Time: Minutes 8.10E+01 Number of timesteps: 40 Number of chains: 1
Start Start in background Reset Show details Create Nuclide Mixture

| Parent+Daughters | Half-life | N(atoms) | M(g) | A(Bq) | Ing.Radiot(Sv) |
|------------------|-----------|----------|----------|----------|----------------|
| 84 Po218 | 3.1 m | 3.72E+13 | 1.35E-08 | 1.39E+11 | 0 |
| 82 Pb214 | 26.8 m | 3.84E+20 | 1.37E-01 | 1.66E+17 | 2.32E+07 |
| 83 Bi214 | 19.9 m | 5.47E+20 | 1.94E-01 | 3.17E+17 | 3.49E+07 |
| 84 Po214 | 1.6E2 µs | 7.50E+13 | 2.66E-08 | 3.17E+17 | 0 |
| 82 Pb210 | 22.17 y | 1.83E+21 | 6.38E-01 | 1.81E+12 | 1.25E+06 |
| 83 Bi210 | 5.01 d | 3.97E+15 | 1.38E-06 | 6.35E+09 | 8.26E+00 |
| 84 Po210 | 1.4E2 d | 8.99E+12 | 3.13E-09 | 5.21E+05 | 6.25E-01 |
| 82 Pb206 Stable | stable | 5.39E+08 | 1.84E-13 | 0 | 0 |
| Total: | | 2.76E+21 | 9.69E-01 | 8.01E+17 | 5.94E+07 |



Dosimetry and Shielding 27 Cobalt

Actual Chart: Karlsruhe

Element: Mass:
Co 60 Nuclide Mixtures Selector

Dosimetry and Shielding Options

Source strength Activity(Bq) 1E+06 Shielding material Pb 10 cm Dose rate (µSv/h)

Source Shield Detector
Source/detector distance (cm) 100

Start Reset
















Half-Value Shield Thickness(cm) 1.88E+00
Tenth-Value Shield Thickness(cm) 4.90E+00

nucleonica




Community Members
Pending Contacts

☒ all Users
☐ my Contacts

| Image | Name | Organization |
|---|----------------------------|---|
|  | MARTINA ADORNI | University of Pisa - DIMNP - GRNSPG |
|  | Aleksandra Schwenk-Ferrero | Forschungszentrum Karlsruhe - Institute for |
|  | Mikael Andersson | Westinghouse Electric Sweden AB |
|  | Martin Badertscher | |
|  | Remigiusz Baranczyk | European Commission DG TREN |
|  | Enrico Barbina | Nabla Progetti Srl |
|  | Valerio Barbina | Nabla Progetti Srl |
|  | Bjoern Becker | Forschungszentrum Karlsruhe GmbH, Institut |
|  | Fabio Belloni | European Commission, DG-JRC, Institute for |
|  | Andrey Berlizov | Institute for Transuranium Elements, EC JRC |
|  | Yuri Bilodid | Forschungszentrum Dresden-Rossendorf |
|  | Emilie BOSSE | CEA |
|  | Berkan Cetinkaya | Ege University, Institute of Nuclear Sciences |
|  | Vanessa Chisté | |
|  | Catalina Chitu | |

Profile
Contacts

Simon Jerome National Physical Laboratory



Send message
Add to Your Contact List

| | |
|-------------------|--|
| Name | Simon Jerome |
| Location | United Kingdom |
| Nationality | British |
| Organization | National Physical Laboratory |
| Job Title | Head of Radiochemistry |
| Areas Of Interest | Radiochemistry; Analytical Chemistry; Radiochemical Analysis; Low-level radioactivity measurement; Inter-laboratory comparisons and proficiency testing; ISO 17025:2005 Technical Assessor; ISO Guide 43 |
| E-Mail | simon.jerome@npl.co.uk |

| | |
|---------------------|--|
| Organization | Loughborough University |
| Address | Ashby Road Loughborough Leics LE11 3TU UK |
| Job Title | Lecturer in Radiochemistry |
| Areas Of Interest | Migration of radionuclides in the environment Effect of organics, natural and anthropogenic, on radionuclide transport |
| Latest Publications | Muhammad Haleem Khan, Peter Warwick and Nick Evans, Spectrophotometric Determination of Uranium with Arsenazo-III in Perchloric Acid, Chemosphere, 63, 2006, p 1165 Peter Warwick, Nick Evans and Sarah Vines, Studies on some divalent Metal a-Isosaccharinic Acid Complexes, Radiochimica Acta, 94(6-7), 2006, pp 363-369. S. Aldridge, P. Warwick, N. Evans and S. Vines., Degradation of tetraphenylphosphonium bromide at high pH and its effect on radionuclide solubility, Chemosphere, 66(4), 2007, pp |

October 2007 Karlsruhe

[edit]

9th Nuclear Science Training Course with Nucleonica, 25/26th Oct. 2007, Ostendorfhaus, Karlsruhe

The 9th Nuclear Science training course on Radioactivity, Radionuclides and Radiation with Nucleonica was held at the Ostendorfhaus, Karlsruhe from the 25th to 26th October, 2007. The two-day course provided a general introduction to the recently released Nucleonica: the new science networking and applications portal. Nucleonica is a powerful and versatile web-based software package for the nuclear science community. With examples and exercises, a variety of core and topical issues in nuclear science and technology were presented by experts in their respective fields.

A total of twenty-nine participants, around half of them women, with a diverse range of backgrounds attended the course. There were participants from Azerbaijan, Belgium, Bulgaria, Czech Republic, Poland, Romania and Turkey. In addition there were 10 participants from the Institute for Transuranium Elements. Among them were students, academics and industry professionals from fields such as nuclear medicine, radiation protection, environmental radioactivity and reactor physics.

[Final Agenda 25th Oct. 2007](#)

[How to get from the hotel to the conference training centre](#)

[Links to the presentations and exercises:](#)

[Networking with Nucleonica \(J. Magill\) Exercises](#)

[Nuclear Data \(J. Galy\) Exercises](#)

[Nuclide Charts \(C. Normand\) Exercises](#)

[Decay Engine \(A. Berlizov\) Exercises](#)

[Dosimetry & Shielding \(J. Galy\) Exercises](#)

[Nuclear Forensics & Illicit Trafficking \(K. Mayer\) Exercises](#)

[Overview of the Institute for Transuranium Elements \(F. Wastin\)](#)

[Advanced Nucleonica Features \(J. Magill\)](#)

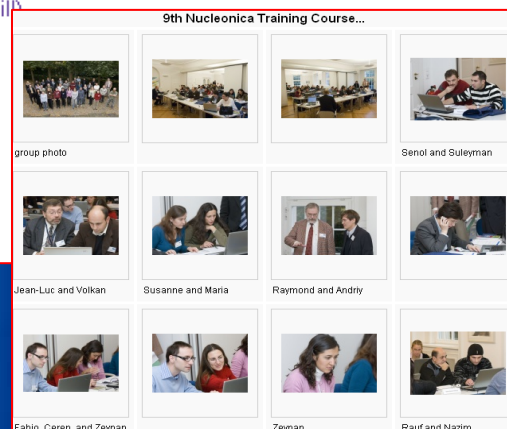
[Training Course Feedback](#)

[QM Questionnaire](#)

[Course Certificate](#)

[List of Participants](#)

[Gallery](#)



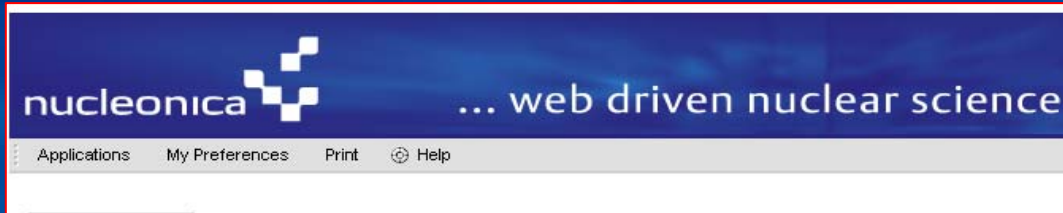
Group Photo Oct. 2007, Ostendorfhaus Karlsruhe



nucleonica

Highlight: webKORIGEN

Starting with an initial reactor fuel or a target nuclide, webKORIGEN calculates the time evolution of nuclide densities changing due to decays and neutron-induced reactions in a PWR, BWR and FR and determines derived nuclear properties such as masses, activities, heat releases, etc.



webKORIGEN



webKORIGEN

Step 1: Calculation Mode Step 2: Reactor / Operation Step 3: Input Summary and Run Step 4: Display Result

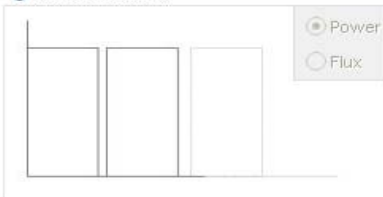
Step 1: Calculation Mode

Step 2: Reactor / Operation

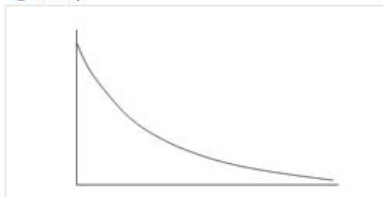
Step 3: Input Summary and Run

Step 4: Display Result

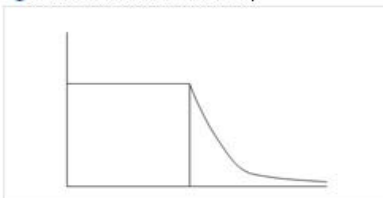
☐ Reactor irradiation



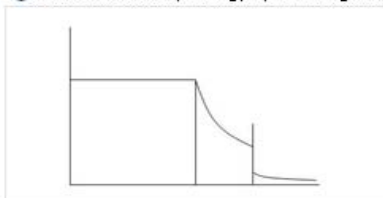
☐ Decay



☒ Reactor irradiation and decay



☐ Reactor irradiation, cooling, reprocessing and decay



Display Results at 6 y for most important nuclides

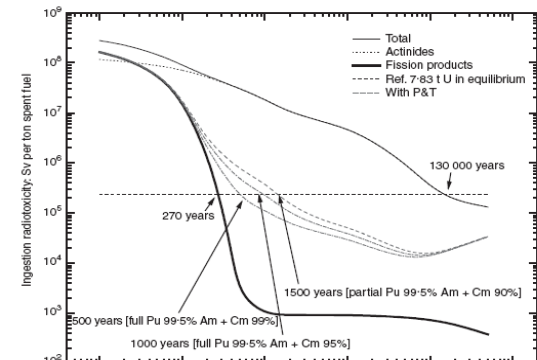
Display quantity: Activity (Bq)

| Top Nuclides | Results | Top Elements | Results | Totals | Results |
|--------------|-----------|--------------|-----------|---------------|-----------|
| Cs137 | 1.095E+17 | Cesium | 1.401E+17 | Actinides: | 1.130E+17 |
| Ba137m | 1.036E+17 | Plutonium | 1.054E+17 | Fission Prod. | 4.670E+17 |
| Pu241 | 9.937E+16 | Barium | 1.036E+17 | Total | 5.800E+17 |
| Y90 | 7.129E+16 | Yttrium | 7.129E+16 | | |
| Sr90 | 7.127E+16 | Strontium | 7.127E+16 | | |
| Cs134 | 3.065E+16 | Promethium | 2.917E+16 | | |
| Pm147 | 2.917E+16 | Europium | 1.209E+16 | | |
| Eu154 | 9.611E+15 | Ruthenium | 9.449E+15 | | |
| Rh106 | 9.449E+15 | Rhodium | 9.449E+15 | | |
| Ru106 | 9.449E+15 | Krypton | 7.199E+15 | | |
| Kr85 | 7.199E+15 | Curium | 6.249E+15 | | |
| Cm244 | 6.205E+15 | Praseodymium | 4.031E+15 | | |
| Pu238 | 5.291E+15 | Cerium | 3.983E+15 | | |
| Ce144 | 3.983E+15 | Antimony | 3.670E+15 | | |
| Pr144 | 3.983E+15 | Americium | 1.313E+15 | | |
| Sb125 | 3.669E+15 | Tellurium | 8.950E+14 | | |
| Eu155 | 2.477E+15 | Neptunium | 4.048E+13 | | |
| Am241 | 1.259E+15 | | | | |
| Te125m | 8.950E+14 | | | | |
| Pu240 | 4.933E+14 | | | | |

Neutron and gamma rates

Neutron rate: 2.491E+10 n/s

Gamma rate from Actinides: 6.427E+13 MeV/s



Highlight: Gamma Spectrum Generator

Co60
10.47 m 5.27 y

Gamma Spectrum Generator

27 Cobalt

Actual chart: Karlsruhe

Getting started
Reference manual
User forum

Element: **Co** Mass: **60** [Nuclide Mixtures Selector](#)

Quantity: **Becquerel** Reference point: **1.000e+8** **Measurement start**

Measurement setup Calculation results Options

Measurement time: **sec** **1000** **Start** **Start in background**

Current configuration: **HPGe, coaxial, p-type, rel. eff. 50% (default)** **Save as** **Delete**

Dimensions in **mm**

Source to Detector distance: **250.0**

Crystal length: **70.0**

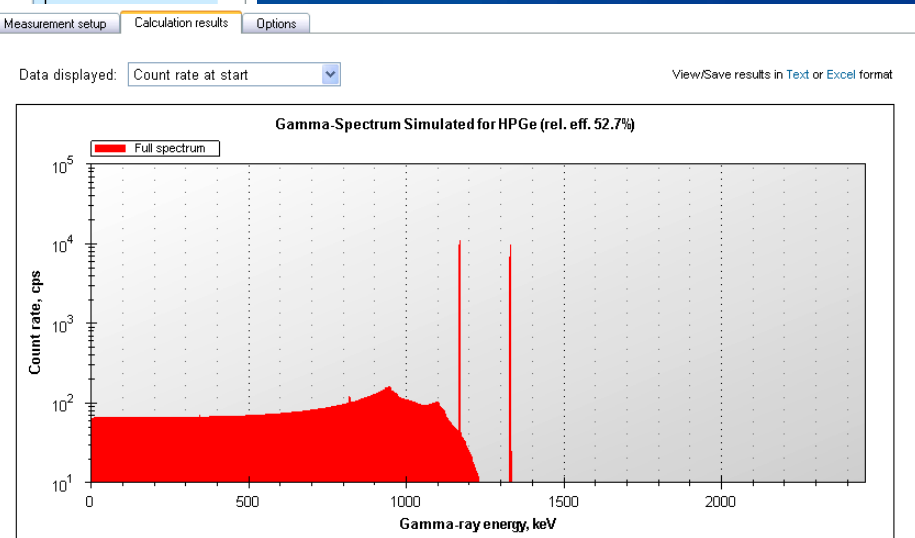
Crystal diameter: **45.0**

Container diameter: **59.0**

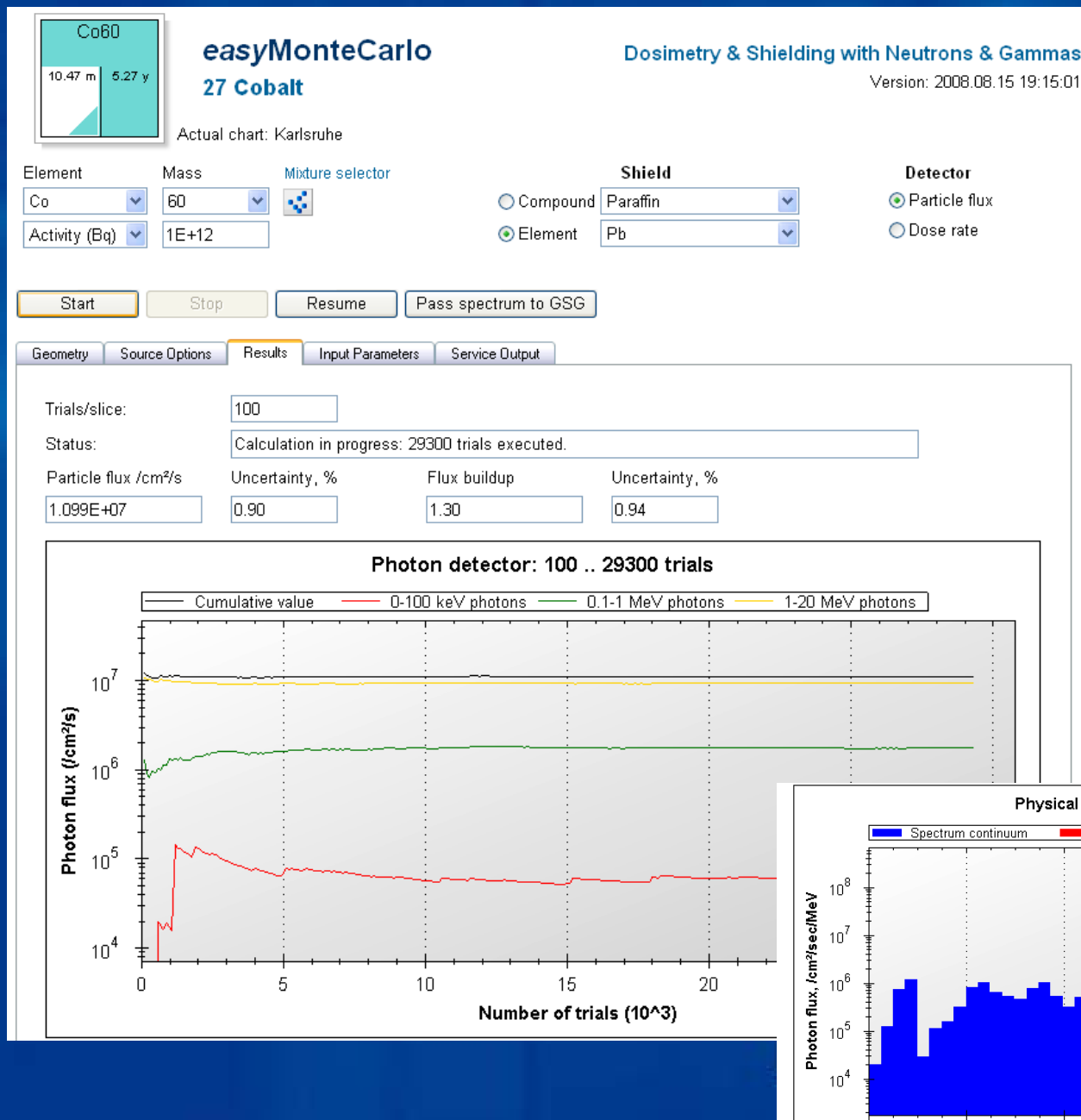
Container height: **10.0**

Gamma Spectrum Generator

... can be used to simulate the gamma spectrum of radioactive substances with a variety of detectors (e.g. NaI, HPGe, etc.). The simulator presents an efficient visual teaching aid that is especially useful in training facilities which have restrictions on the use of radioactive substances, or when sources of special interest are not readily available.



Highlight: *easyMonteCarlo*



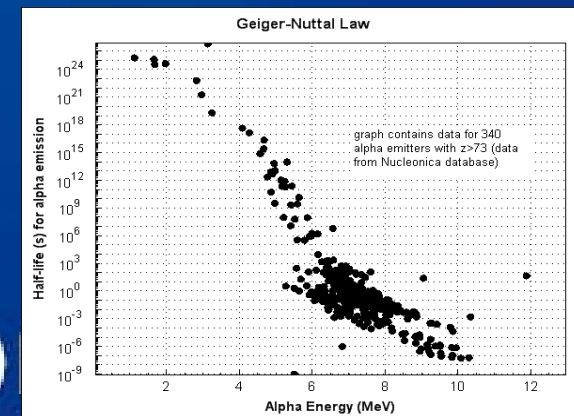
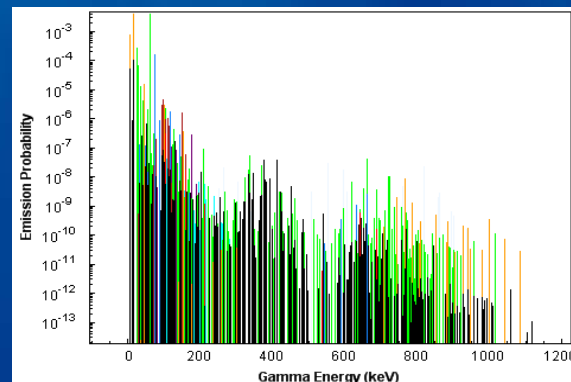
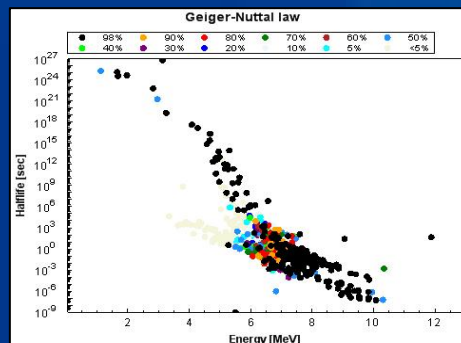
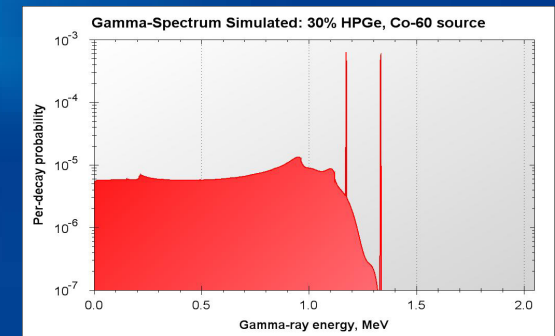
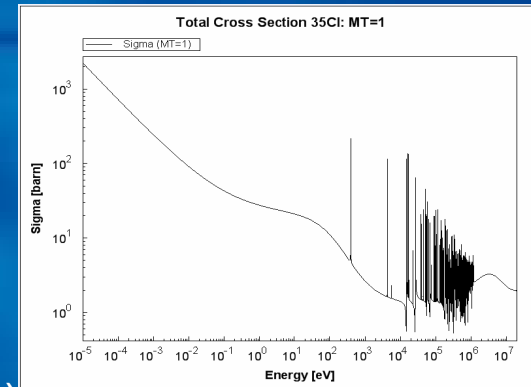
easyMonteCarlo:

easy to use, fast, accurate dosimetry and shielding calculations for gammas and neutrons using Nucleonica's powerful Monte Carlo engine. Investigate the effects of self-attenuation in the source, build-up effects in the shield etc., on the dose rate and the particle flux distribution at the detector...

webGraphics...

The Nucleonica webGraphics Features:

- No need to buy expensive commercial software
- Easy to use
- Delivers publication quality scientific graphs
- Variety of formats available (gif, jpg, emf, eps, png, svg)
- Graphics configuration can be stored for future use
- Available at any time from any location
- Under constant further development



Conclusions: Key Advantages of Nucleonica

- Keep informed with the latest news on nuclear issues
- Use internationally evaluated nuclear data in your work
- Extensive range of nuclear science applications
- Manage all your data in a single browser-based system and keep track of your recent activities
- Prepare a lecture or a training course with Nucleonica materials (graphics. etc.)
- Prepare publication quality scientific graphs
- Stay in contact with your colleagues from previous employment, workshops or conferences
- Meet scientists from your areas of interest and build up an international contact list and represent yourself and your Institute/Organisation in the international science community



nucleonica



Thanks!



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